Amendment Conference of the States Parties to the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water

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VIEWS REGARDING THE VERIFICATION OF A COMPREHENSIVE NUCLEAR-TEST BAN

Addendum

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FINLAND

[Original: English]

[10 December 1990]

Ever since the beginning of underground nuclear testing in the 1950s, seismic methods have been considered to provide a tool for global monitoring of such tests. Many national and international efforts have been undertaken in order to improve seismological means by which to detect and discriminate between earthquakes and explosions. Recent progress in this field is mainly due to the rapid development of technology for automatic signal detection, processing and communication.

These developments have been reflected in the work of the Ad Hoc Group of Scientific Experts to Consider International Co-operative Measures to Detect and Identify Seismic Events. The Ad Hoc Group, working under the auspices of the Conference on Disarmament at Geneva, is planning a global seismological monitoring system for the verification of a comprehensive test ban. Finland has participated actively in the work of the Ad Hoc Group since its inception in 1976. Finnish participation is greatly assisted by the existence of a sophisticated national network of seismic stations and the requisite expertise as well as by the fact that the bedrock in Finland provides optimal conditions for seismic detection.

In 1984, Finland began a special research project of seismological verification managed by the Institute of Seismology of the University of Helsinki. The project is funded by the Ministry for Foreign Affairs and its sole purpose is to contribute to developing the technical means for the detection and identification of seismic events in the context of a future comprehensive nuclear-test-ban treaty.

Seismic verification facilities are not equally distributed around the globe. As their density in the southern hemisphere, particularly in Africa, is much lower than in the northern hemisphere, Finland has for the past decade co-operated with Zambia in establishing a seismic network in that country.

Finland will, at the Conference itself, make available to the delegations information concerning Finnish activities in the field of seismological verification of nuclear tests.

Based on our own research, Finland has concluded that seismological methods together with other relevant means, including on-site inspections, are sufficient to meet the requirements of verifying compliance with a ban on underground testing.

NEW ZEALAND AND AUSTRALIA

[Original: English]

[13 December 1990]

INTRODUCTION

1. New Zealand and Australia share a common commitment to the achievement of a comprehensive ban on nuclear testing. The resolution submitted jointly by Australia and New Zealand at this year's General Assembly emphasis that:

> "an end to nuclear testing by all States in all environments for all time is an essential step in order to prevent the qualitative improvement and development of nuclear weapons and their further proliferation, and to contribute, along with other concurrent efforts to reduce nuclear arms, to the eventual elimination of nuclear weapons."

2. Despite overwhelming endorsement in the United Nations of the call for the early achievement of a CTB, there has been little substantive progress towards this goal. New Zealand and Australia share the sense of frustration felt by many countries that the major achievements of recent years in disarmament and arms control have not been matched by comparable progress on a nuclear-test ban. The two countries intend to participate positively and constructively in the partial test-ban Treaty Amendment Conference (PTBTAC). We see the PTBTAC as providing a good opportunity to discuss in depth ways of furthering the objective of a CTBT, particularly on the important issue of verification.

3. The achievement of an effective CTBT is of course a global concern, and the need for verification clearly is not confined to the existing nuclear-weapon States. New Zealand and Australia firmly believe that a CTBT has an essential role in preventing the horizontal and vertical proliferation of nuclear weapons. The achievement of a verifiable nuclear-test ban would considerably strengthen the non-proliferation régime based on the NPT, IAEA safeguards and nuclear-free zones.

VERIFICATION REQUIREMENTS

4. One fundamental argument that has been put forward against a CTBT is that a nuclear-test ban would not be verifiable. The Governments of Australia and New Zealand do not accept this view. Substantial scientific evidence is now available establishing the feasibility of verifying a nuclear-test ban, particularly through seismic monitoring. It is technically possible to detect underground nuclear tests with a high degree of confidence down to very low levels.

5. In the view of New Zealand and Australia the development of an effective verficiation mechanism is an important part of the process of creating an effective, widely supported, and verifiable CTBT. Effective verification is, however, only part of the whole process which will need to involve a political will on the part of a number of key players before it can be achieved. In the mean time we see great value in taking as far as we can the development of an effective verification mechanism.

SEISMIC VERIFICATION TECHNIQUES

6. The two countries consider that the work carried out within the Conference on Disarmament by the Ad Hoc Group of Scientific Experts (GSE) is of fundamental importance in demonstrating that technical means exist for the verification of a CTBT.

7. The first report of the Ad Hoc Group in 1978 (CCD/558) presented the results of a study of the detection ability of a hypothetical global network (network III (SRO)) of digital broad-band seismographs located at then-existing seismograph stations. It was estimated that this network would have a 90 per cent chance of detecting an event of magnitude 3.8 to 4.2 (or greater) in the northern hemisphere and of 4.0 to 4.6 (or greater) in the southern hemisphere. Magnitude 4.0 corresponds to an explosion of less than 10 kilotons in most geological environments and much less than this level in some environments.

8. The third report of the Group (CD/448) in 1984 pointed to significant developments in seismic instrumentation, including the installation of more seismic arrays. Since that date, there have been still greater improvements, particularly in response to the initiatives of the Ad Hoc Group. While further study is needed to evaluate accurately the capability of the present global network, it is clearly very close to that projected in 1978, and may well be significantly better.

GSETT-2

9. New Zealand and Australia both strongly support, and are participating in, the second technical test on the global exchange and analysis of seismic data being conducted by the Group (GSETT-2). The two countries are contributing data from monitoring stations in Australia and New Zealand, and also from stations as far apart as the Cook Islands and Antartica. All together, this seismic monitoring system covers a major part of the southern hemisphere, and represents an essential component in the global scope of the experiment.

10. Both New Zealand and Australia have recently upgraded their seismic monitoring and data transmission equipment as a further part of their contribution to GSETT-2. Australia is acting as one of the four international data centres for this experiment. The seismic arrays operated by Australia have the facility for enhancing weak signals by data processing techniques, which makes a major contribution to the global network's detection ability, particularly in the southern hemisphere.

11. The two countries are also well placed to contribute to the experiment because of their extensive experience in using seismic detection to monitor nuclear tests. Both New Zealand and Australia have for many years been closely monitoring France's nuclear testing programme at Mururoa atoll in the South Pacific. Scientists in New Zealand and Australia have accordingly developed considerable practical expertise in the seismic monitoring of underground nuclear tests of varying magnitude.

12. New Zealand's monitoring of explosions in French Polynesia, using a seismograph station in the Cook Islands, has demonstrated the particular sensitivity of such stations to tests in oceanic areas. This would be an important factor in a global monitoring network.

13. Based on this collective experience, it is the considered view of the Australian and New Zealand Governments that seismic monitoring offers a reliable means of verifying a CTBT. The successful conclusion of GSETT-2 will further strengthen confidence in the effectiveness of a global seismic monitoring and data transmission system down to a very low level.

EVASION

14. The possibility of evasion has been put forward as a reason to doubt that a CTBT could be adequately monitored. Various technical scenarios have been put forward for ways in which countries might evade detection, primarily through "decoupled" explosions in underground cavities. However, the technology to attempt such evasion is unlikely to be available outside the existing nuclear-weapon States, and the risk of detection would be extremely high and would increase with each test.

15. With in-country networks of seismographs to enhance the detection capability of the global network, it is likely that even the most elaborate precautions would not prevent the detection of explosions at levels as low as 1 kiloton. Attempts to evade a nuclear-test ban would therefore be confined to a level at which the military advantages to be gained from clandestine explosions would be minimal and the chances of escaping detection would be extremely low.

OTHER VERIFICATION TECHNIQUES

16. While seismic detection would be a vital factor in the monitoring of a CTBT, verification need not depend on this alone. A network for monitoring airborne radiation, as proposed by Sweden, would provide valuable collateral support to a global seismic monitoring network. Satellite surveillance data would also help confirm international adherence to a CTBT.

17. A recent development has been the increased acceptance of on-site verification in other areas of arms control, following the precedent first established by the IMF Treaty. This could also be extended to verification of a nuclear-test ban. The ratification of the Protocols to the threshold test-ban Treaty and the peaceful nuclear explosions Treaty has now set a further example for co-operation on verification procedures.

18. On-site verification, which is already widely accepted as an important component of arms control agreements, might also provide further assurance of compliance with a CTBT. The international disarmament process has advanced dramatically since the seismic monitoring network was first proposed, when national technical means were considered the only effective means of verifying compliance.

Co-operation on measures for on-site verification, such as the placement of seismometers at possible test sites, would strongly reinforce a teleseismic verification system.

WIDER PARTICIPATION IN SEISMIC CO-OPERATION

19. In order to develop a global seismic monitoring capability down to a very low level, it will be necessary to improve the coverage of seismic stations in Africa, South America and Antarctica. The involvement is therefore necessary of a wider group than is currently involved in the Group of Scientific Experts (GSE) in the Conference on Disarmament.

CONCLUSION

20. In summary, New Zealand and Australia consider that there already exists compelling scientific evidence that a nuclear-test ban is verifiable using technology currently available. The ongoing work of the Group of Scientific Experts is providing substantial technical corroboration for that view. The argument advanced by some nuclear testing States, that a nuclear-test ban is not possible because it could not be verified, has consequently become increasingly difficult to sustain.

21. New Zealand and Australia consider that considerable progress has already been made towards the development of an adequate mechanism to verify a nuclear-test ban. The ongoing work of the Group of Scientific Experts is important in this respect and the Group needs to continue its work with the benefit of a wider membership.

22. The two countries believe that a significant achievement from the partial test-ban Treaty Amendment Conference would be the recognition by States party of the progress made towards a fully effective international verification system, the endorsement of the efforts of the Group of Scientific Experts to demonstrate the technical feasibility of such a régime, and a call on more States to participate in the GSC to improve in particular coverage of seismic stations in Africa, South America and Antarctica.

POLAND

[Original: English]

[29 November 1990]

Verification of compliance with a nuclear-test-ban treaty is unquestionably a very complex matter. It requires an extensive set of sophisticated sensors, emplaced spatially in various environments; it necessitates amiability to assess and to communicate the data provided by the sensors. Because it deals with physical, that is, basically seismic phenomena any measurements used in the process

of verification are by definition only approximations, dependent on a number of variables (quality of a sensor, quality of computing system, geological medium at the site of a seismic event and between the site of an event and a site of a sensor, distance between the two sites, nature of a seismic event, and many others). It is thus always open to subjective assessment or to error, especially as the quality of technology used and the level of knowledge about the subject-matter are not evenly distributed internationally. Verification of a nuclear-test ban is therefore highly dependent on international co-operation and as such it is very sensitive to a political atmosphere between the parties which established a given system of verification. In the opinion of the Government of Poland it is this political environment and not the complicated nature of nuclear-test-ban verification which has, until now, thwarted the international efforts to halt and ban all kinds of nuclear tests. However, the political developments in the international relations of the last year raise hopes for a tangible change in this area. These developments not only facilitate the international acceptance of the very intrusive verification methods but, what seems much more important, they open the prospects for a substantial decrease of the political and military importance of nuclear weapons.

Poland notes with great satisfaction the ratification by the United States and the Soviet Union of the threshold and PNE treaties, together with protocols on their verification. The verification systems established by these treaties are based on a variety of methods including the calibration tests, seismic and hydrodynamic instruments and on-site inspections. The extent of information to be exchanged prior to and after the prospective nuclear explosions, as well as the provisions on long-term co-operation in the verification activities create a sound basis for a further expansion of mutual confidence and expertise. The achievement, embodied in the verification system of these two treaties, has been made possible by a wide involvement of not only governmental but also private scientific organizations and personalities. The scope of co-operation in the application of the highly intrusive verification methods, adopted in the protocols to these two treaties, indicate clearly that the two nuclear States would be able to monitor effectively a ban on nuclear testing on a considerably lower level of the explosive yield. However, it should be stressed that the bilateral arrangements, commendable and politically very helpful, seem not readily applicable for a prospective multilateral agreement banning nuclear tests. The verification system of a multilateral measure would have to cope with a possibility of an explosion taking place in an unknown location, hence the need for a global network of seismic arrays and an appropriate system of data transmission. The organization of the verification system would have to be more structured. The greater probability of a false alarm or an occurrence of a suspected event would require a pre-determined system of international response.

A number of States already possess a remarkable level of expertise and sophisticated technology applicable to monitoring and identification of seismic events. However, to be effective and credible the truly comprehensive nuclear verification system has to be based on a wide international spread of this technology and expertise. Owing to various political, technical and financial reasons, this postulate is still far from being realized. It is incumbent upon States desiring a comprehensive test ban to take a much more active part in the

preparation of a global network for seismic monitoring. In this regard Poland considers as vital a wide international participation in the technical tests carried out by the Ad Hoc Group of Scientific Experts under the aegis of the Conference on Disarmament at Geneva. The establishment and development of several national monitoring facilities, the setting up of the international data centres, the amelioration of an international data transmission network - all these efforts will gradually bring the international community closer to a technical preparedness to verify a global nuclear-test ban. An international seismic monitoring network should constitute an important part of an effective verification system of a nuclear-test ban.

In addition to seismic monitoring proper consideration should be given to other possible means of verifying the compliance with a future CTBT. Among such means to be considered could be atmospheric radioactivity surveillance; satellite remote sensing and on-site inspections. Adequately designed monitoring techniques could reinforce the reliability of the whole verification system.